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PHILOLOGY OF THE CHINESE LANGUAGE.*

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The Chinese language undoubtedly forms one of the largest and most interesting of all the various fields for philological research. Its great antiquity; its unique and and primitive character; the unparalleled millions of people who have made use of it; its vast accumulation of words, resulting from milleniums of continuous growth; its independence of all foreign accessions; and its high literary development—all combine to make it one of the richest and most inviting subjects for the consideration of the philologist. It is an almost inexhaustible mine, only waiting to be explored, for facts that will tend to confirm or else to refute the generally received theories as to the origin and growth of all spoken and written language. No other language, ancient or modern, has successfully resisted the substitution of a phonetic system of marks or alphabet for the primitive ideographic or symbolic representation of ideas. The Egyptian hieroglyphics, although of equal antiquity with the Chinese characters, which they somewhat resemble, gradually gave way to phonetic signs or letters; but the Chinese pictorial representations have maintained their ground scarcely altered, up till the present

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time; so that inscriptions two thousand or more years old are still read without difficulty, and books written thirty centuries ago are daily quoted as good authority for the highest style. The isolation of the Chinese does not begin to account for this. The laconic and vigorous nature of their written language, appealing with most wonderful force both to the eye and to the ear, they are unwilling to exchange for the uncertain meaning of mere phonetic marks. Cumbersome as their characters appear to our eyes, and confusing as the jargon of so many similar monosyllabic sounds seems to our ears, the Chinese experience no serious difficulties in expressing in their own way the most elaborate and abstruse ideas they are able to conceive, as well as all the affairs of every-day life.

A consideration of the Chinese language naturally divides into two parts: (1) the Chinese considered as a separate language; and (2) considered in comparison with other languages. To begin to do justice to the various subdivisions of such a comprehensive subject would require a long series of papers, or a work in many volumes. The utmost that can be done within the space allowed for this paper will be to give the barest outline of the nature and construction of the Chinese language, adding here and there a point of comparison with other languages.

At the very outset we must endeavor to define what is generally meant by the Chinese language. When we are told that the spoken and the written languages of China are really different languages, it is difficult for us, who habitually speak much as we write, and write much as we speak, to conceive of the co-existence of two languages in a people, one used only in conversation, and the other only in writing. Yet such was the case in England from the Norman Conquest up to at least the middle of the fourteenth century, and such is the case in parts of Europe at this day, especially in Italy and Germany. Even among ourselves, the writings of Artemus Ward, Mark Twain, and other amusing attempts to imitate the sounds of the words,

and the strange expressions of the rustic and uneducated classes in America, show very wide modifications of the English tongue from that spoken by the educated people or written by our best authors. Among the Chinese, however, not only are the spoken and written languages different, but there are many varieties of the spoken, and many styles of the written, so that we ought to call them collectively the Chinese *languages* rather than the Chinese *language*. Let us understand therefore, once and for all, that when people refer to the Chinese language they cannot mean one particular language, but the conglomeration of spoken and written languages, all possessing more or less of common ground or relationship. It may be compared with the whole of the European languages in connection with Latin and Greek. Hence to talk of the Chinese language is about as ambiguous as to speak of the language of Europe! In a general way Chinese may be divided into various forms of the living or spoken and of the dead or written languages used throughout the Empire, as well as in some of the neighboring countries.

Of the many forms of spoken language, that which is known as the Mandarin, or *Kuan-hua*, is the most generally used, being now with its various modifications, the official and polite language spoken over about four-fifths of the Empire and in some of the neigboring countries.

The dead or written language is of various forms or styles such as the Ancient Classic, the Modern Classic, the Official, the Documentary, the Commercial, the Epistolary, etc. This is collectively known as the *Wen-li*, or the classical scholarly language of China. It forms the language of books and correspondence which is used all over the Empire. It is also the learned or highest form of written language used in Japan and Corea. It has proved one of the most powerful means for keeping up the solidarity of the vast Chinese nation for so many centuries, being an indissoluble bond between people of so many widely different tongues and characteristics.

The researches of several distinguished philologists have shown almost conclusively that there is a wonderful similarity between the sounds of many of the elementary Chinese words and those expressing the same ideas belonging to the languages of Western Asia and Europe;—thus pointing to a common Aryan source. Even in such a remote language as the English there are many instances of this similiarity of sound to the Chinese which can hardly all be considered as accidental. In Greek, Latin, Hebrew, Arabic, Persian, and Sanscrit the resemblances are, of course, still more numerous. It is worthy of note that among the ancient sounds of the Chinese characters there are far more of these resemblances than among the modern sounds; thus pointing to a more remote common origin. Of late years various sinologues have given what they consider reliable proofs of the Babylonian or Accadian origin of many of the sounds as well as of the characters of the Chinese language. Their inference is that the early Chinese came from some western region bringing their ancient language and civilization with them. Until this very plausible theory is fully demonstrated and accepted, it is well to reserve our judgment respecting it. The Chinese themselves have only a faint idea of the science of philology. From their "*shuo-wen*" we gather a few facts as well as speculations regarding the forms and sounds of some of the older characters. Some ingenious Chinese writers try to show that the sounds of many elementary Chinese words are imitations of those heard in nature. Thus many of the names of animals or the names of actions have sounds similar to those produced by the originals; and this is only what might be expected in a primitive language, which the Chinese most probably is.

With all their literary pride the Chinese can give no satisfactory account of the origin of their written language. They say that a Minister of the Emperor Hwangti, B.C. 2697, invented the existing system of forming the characters, of which 540 were then in common use. He looked

up to heaven and observed the shape of the constellations, and down to the earth to examine the lines on the back of the tortoise, with the footprints of the birds; from these he obtained his system of characters to represent the commonest objects and ideas. There can be no doubt that the Chinese system of written characters was originally framed on similar principles to the Mexican, the Egyptian, and the Babylonian, only under a somewhat different form. The Chinese characters representing such familiar objects as the sun, moon, hills, man, horse, sheep, the eye, mouth, tree, carriage, bow, nail, etc., used to be more or less rude pictures of these objects; but in order to suit the use of the Chinese pen or brush all the curved lines are now made straight; yet the pictorial character is preserved.

"Necessity is the mother of invention." Having these simple outlines to represent visible objects, it became necessary to combine them in such a way as to express abstract ideas. The study of the process of word-building is especially fascinating because a large proportion of these compounded characters is still necessarily ideographic. These ancient word-builders often used the most crude and even grotesque ways to represent their conceptions of ideas. For instance: the original forms were multiplied, as by writing two trees side by side a forest was represented. Different original forms were combined, as by writing the sun and moon together to express brightness. Phonetic elements were added, of which there are now seven to eight hundred; all giving more or less clue to the sound of the characters to which they are united. Descriptive forms were invented; and so on. Some of these characters serve to illustrate in a very striking manner the Chinese conception of ideas. For instance: a man and a word mean sincerity, or the word of a man; a mouth and a dog mean to bark; a mouth inside a door means to inquire, while an ear inside a door means to listen; and so on. This is a species of etymology that cannot be found in any other existing language.

The laws which govern the growth of other languages all apply more or less to the Chinese. Though essentially monosyllabic, yet certain characters are frequently used in combination. For instance, wood, or a tree, combines with material to mean timber, with a work-man to mean carpenter, with coal to mean charcoal, etc. These are as much compound words as the English woodman, woodwork, woodcut, etc. It is remarkable, however, that while in other languages such elementary words run together to form compound words, yet in Chinese no such union has ever taken place. The primitive syllables continue to be sounded and written separately as complete words; there is no agglutination whatever. But the Chinese language has grown from without as well as from within. Many words were derived from the aborigines; from the Buddhist missionaries, who introduced Sanscrit terms; from the Arabic, Persian, Manchu, and Mongolian intercourse, and in other ways. Recently the language has been greatly enriched by the introduction of Western terminology, so that characters of a phonetic or descriptive nature, either single, or more generally in combination, are now in common use in the native newspapers and current general literature, which were not even thought of a generation or two ago. Every year brings fresh accretions of this kind to the language. The national spirit of conservatism, however, shows itself in the unwillingness to give up a single character that has ever been in general use. Hence while new characters have continually been added none of the old ones have been absolutely dropped. The result is an enormous number of characters, estimated from forty thousand up to about two hundred and fifty thousand, although only about six thousand are in current use.

For purposes of classification in dictionaries and other lists of words the Chinese characters are arranged under two hundred and fourteen classifiers or radicals; all more or less ideographic. Most of the Chinese characters in present use are made up of two parts, the radical and

the phonetic. From the pictorial radical a clue to the meaning is obtained, while from the conventional phonetic may be gathered a clue to the sound. Thus all the characters bearing the tree radical would be the names of trees, or articles made of wood, or ideas having some connection with trees or wood. This ingenious system of classifiers or radicals is similar in principle to that sometimes found in Egyptian hieroglyphics, and in the Assyrian cuneiform characters. For instance, the Egyptians used an oval line to surround the name of a king; the Assyrians used a perpendicular wedge-shaped form before a word to show that it was the name of a man. It is impossible to say which of the nations of high antiquity was the inventor of this system.

The number of separate sounds in the various dialects or spoken languages in China varies considerably. In the Mandarin dialect, as spoken in Peking and its vicinity, there are twenty-seven different vowel sounds, and twenty-two different consonant sounds. The combinations of these that are in use in Peking form only about four hundred and twenty different sounds, or monosyllables. With the large number of words in the language it is plain that some of these sounds must be made to serve for many words, varying from two or three up to several hundreds. Some difference in the tone or inflection of the voice used in pronouncing them is clearly the only plan to avoid perpetual confusion. The Pekingese have now only four of these tones or inflections of the voice, known as the "upper even," "lower even," "rising," and "departing" tones. These tones form one of the greatest difficulties in acquiring any of the spoken languages of China. The number of sounds and tones varies in different parts of the Empire. The Cantonese has twelve tones arranged in an upper, middle, and lower series. Other dialects have still more tones. The use of the aspirate is also of great importance, occurring as it often does in the middle of a syllable. It will be seen from the above statements that

the context or association and the tone, form the means by which only four hundred to five hundred sounds can be made to do duty for the tens of thousands of words composing the Pekingese or any other of the languages of China. A scholar once wrote an essay of two thousand or more words each having the sound of "I" so that to read it, was merely to repeat "I" so many times, in the different tones that were necessary.

If to the above difficulties that exist in the Chinese language there were to be added a strict and rigid system of grammatical rules, inflections and changes, such as abound in some Western languages, the task of learning it might well be considered as almost hopeless. Fortunately, however, there is practically no grammar in Chinese. The words express root ideas without reference to parts of speech, and may generally be used as nouns, verbs, adjectives, or adverbs indiscriminately without any change whatever. Moods, tenses, voices, persons, gender, and number make no difference to the way in which a character is written, although the tone in which it is pronounced may sometimes be varied. Conjugations, declensions, regular, irregular, and auxiliary verbs, etc., are distinctions which have never yet entered the Chinese student's mind, or distressed his youthful brain. In the absence of inflections these various differences in meaning are either sufficiently shown by the context, by the relative positions of words in a sentence, or by the addition of other words. With such extraordinary advantages, is it any wonder that every Chinaman is a born orator? In the highest class of Chinese books or correspondence no kind of punctuation is attempted. It would not be polite to send a letter to a literary man with punctuation marks, for it would imply that he could not read without such assistance!

Numbers are usually expressed by the use of only thirteen characters with their combinations. These represent one to ten; after which come hundred, thousand, and ten thousand. Each of these characters has three forms in

which it may be written, *viz.*, the ordinary, the complex, and the commercial. Some of the numerals, especially when written rapidly, are so much like our Arabic figures that there is a strong presumption that the Arabic system was borrowed from the Chinese either directly or through some of the intervening countries. The numerical system in in some respects resembles the Roman. It takes almost as many Chinese characters to represent a high number in the full form as it does letters to write in the Roman form. The Chinese ten is the Roman ten with its two strokes written, one vertical and one horizontal, instead of both oblique as in the Roman. There are characters representing a hundred-thousand, a million, ten millions, and a hundred millions, but these are very seldom used, high numbers being generally expressed as so many tens of thousands or myriads. Cardinal numbers are all changed to ordinal numbers in Chinese by the addition of the character "ti" before them, somewhat like our use of "th" after some of ours.

One peculiar feature of the Chinese language is the large number of words which have been called numerative adjuncts. We speak of a pane of glass, a length of rope or cloth, two head of cattle, a game of chess, three volumes of a book, etc. But we have only a few of such words, while the Chinese have a great many. In general every Chinese noun has its fixed numerative adjunct; as a handle of knife, two persons of men, three mouths of wells, four doors of cannon, four faces of drums, etc. These numerative adjuncts are of great assistance in conversation where so many different things are expressed by the same sound.

Although primarily consisting of but four or five hundred elementary forms, the many thousands of combinations of these forms give the Chinese, as far as the written language is concerned, a power of expression unknown in other languages. The simple and logical nature of its formation ought to render it a far more efficient medium for the communication of ideas, and as an instrument of

thought than any of the languages of Europe. These Chinese characters have a double advantage. They present to the eye of the initiated the pictures of things, and the general terms derived from them. They also at the same time address the ear by the simple form of their phonetic construction. Thus the most complex notions and the most general expressions can be conveyed to the mind without disturbing the general unity which should exist in a sentence. The language of books and the language of conversation, though differing widely in the number and meaning of the words employed, are the same in their simple and logical construction and order. It is easy to see that this is a great advantage. Without any sort of inflection in its words, Chinese offers a wonderful exemplification of the power of syntactical arrangement to express the multitudinous variations of human thought. With a stock of only four or five thousand characters all thoroughly well known and understood, the literary man can read and write with accuracy, the myriads of combinations by which they may be made to represent almost every idea that the mind can conceive. The Chinese language affords scope for expansion in the most natural manner so as to express all the subtleties of Western thought. There have been Western students of the written language who have become so thoroughly fascinated with it as to believe it could easily be made the international or universal language, and take the position proposed for "Volapük." What now serves as a written medium for almost half of the people of the globe, speaking a great variety of dialects, they think could surely be made available for the other half! Its terseness and freedom from all grammatical inflection should certainly render its acquisition and use extremely easy by every nation. But on the other hand the idiom and syntactical arrangement of the characters to express the various shades of ideas would render considerable study necessary before freedom and accuracy in its use could be acquired sufficient for international purposes.

The spoken languages of China may be divided into two groups:—Foreign languages and Native languages. Of the Foreign languages, the Indo-Chinese is the most important. Next comes the language spoken by the aborigines who are scattered about in tribes among the mountain fastnesses. Then come the Turkish, the Mongol, and the Manchurian. With the exception of these, the whole of the Chinese people speak languages or dialects which are entirely Chinese. These languages may be divided into four principal groups: (1) First comes the Mandarin or official language, called the "*Kuan-hua*," spoken by about four-fifths of the population and distinguished by three principal varieties:—the northern, the central, and the western. This language can all be written, and it has a literature of its own, but differs widely from the classical language and is, of course, considered greatly inferior to it. (2) The next in importance are what are called the "*Wu*" languages or dialects, of which the Ningpo, the Soochow, Shanghai, and Wenchow are the principal. (3) The "*Min*" dialects or languages, consisting chiefly of the Amoy, Foochow, and Swatow. (4) Lastly come the "*Kwang-tung*" dialects or languages, of which the Cantonese and the Hakka are the chief varieties. Each of these divisions has a large number of sub-dialects or *patois*. It often happens that in merely crossing a river or a hill one finds the language has materially changed; not only different sounds and different tones being used for the same word but often entirely different words to express the same idea.

Summarizing the ground we have gone over, we see that the Chinese is not one language but many; that the spoken language may either have been primitive or of Aryan origin; that the written language was originally pictorial or ideographic, like the Egyptian, and though since modified in various ways retains its pictorial and monosyllabic character; that it has grown from within and without, on the same principle as other languages, excepting that it has never allowed its words to combine or agglutinate, or

become subject to grammatical inflections; that its radicals or classifiers resemble in use those of the Egyptian and Assyrian; that the small number of different sounds is compensated for by the use of peculiar tones or inflections of the voice; that there are certain advantages in the Chinese language which do not exist in any other; that its system of numerals, though primitive, is efficient, and in some points resembles the Arabic and Roman; that the spoken languages are divisible into four groups with numerous subdivisions; that the language is capable of indefinite expansion so as to express the various departments of Western learning without any serious difficulty, and that for some reasons it would well serve for international purposes.

In conclusion, I venture the opinion that the written language of China must necessarily last while the nation lasts. The teachings of Confucius and the other sages can be conveyed in no other words, and in no other form, than those in which they were originally written. The growth of thousands of years, which embodies the philosophical, the historical, and the political knowledge and life of the hundreds of millions in China, Japan, Corea, The Loochoo Islands, Manchuria, Mongolia, and Thibet is not likely to yield to a foreign tongue, but to last for many centuries to come. Even if China should come under foreign control this unique and wonderful language will have to remain unchanged, and will have to be learned by all who wish to carry on commercial or other intercourse to advantage with the inhabitants of the "Flowery Land."

NEW PROBLEMS IN THE STUDY OF SOCIETY.*

By BERNARD MOSES.

It is not my purpose in discussing this topic to offer solutions, but simply to point out problems. My attitude for the time being is not that of a reformer, nor that of a moral critic; merely that of an inquirer about society and some of its unsettled questions. In this capacity one must hold society in a purely objective relation to himself; he must hold it as the biologist holds the subject-matter of his inquiries; he is concerned only with the nature and relations of the facts which it reveals. This position is not easily assumed, for most of our training leads us to examine society primarily with reference to its moral qualities and its moral achievements. This position, after it has been taken, is not readily appreciated by our friends. If one states a fact concerning society that seems to be shown by impartial observation, and that fact happens not to be in accord with the traditional judgment of the community, the impartial investigator has thereby forfeited some measure of the respect of his fellows. Society is at present not quite a free field for inquiry. Patriotism or provincialism limits our inquiries in the realm of society just as our traditional religious views limit our inquiries in the realm of the supernatural. Still, if one would give to his studies of society a scientific quality, he must assume

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the intellectual rather than the emotional attitude toward his material. If, after mature observation and research, you affirm that American society from the agricultural simplicity and equality of the colonial days has grown to be marked by wider extremes of condition, you run the risk of being charged with advocating aristocracy. We seem not to be quite far enough on in our cultivation to appreciate that one may state facts about society without involving his personal preferences.

It is in this spirit of impartial inquiry that social studies should be made. They should be made, moreover, in the thought that every age has problems peculiar to itself; and that when the problems of to-day are solved, to-morrow will bring a still larger group. With every decade society becomes more complex. There are consequently more points of possible friction, and, therefore, more adjustments needed in the interest of harmony and effective work. If society moved in cycles, as our ancestors believed, these new problems of adjustment would not appear. A series of old social problems would reappear at intervals throughout the centuries of human history. After one cycle had run its course there would be no new problems. Each phase of social life would be a reproduction of an earlier phase. History would repeat itself. But the life of society does not run in cycles. It runs on and on in an ever-changing environment, and with an ever-changing spirit. A position that is abandoned is abandoned forever. The problems which our ancestors solved will not be presented to us, and those which we solve will not demand the attention of our posterity; and this is true because human society is marked by progress and not by recurring cycles.

Every age is, therefore, an age of transition; but the several ages differ from one another as it regards the rapidity of social movement. In the life of the race there are decades, and sometimes centuries, when little progress is made, when year after year passes without modifying the

ideas of society or adding greatly to its material equipment. These seem to be barren places in history. They are not, however, really barren; they are simply periods when the soil is lying fallow and preparing itself for a subsequent growth. In other periods the achievements of a few decades may transcend those of many previous centuries. A striking instance of remarkable growth after a long period of barrenness is observed in the development of means of communication and transportation. In this century more has been accomplished in this matter than was accomplished in all the previous centuries of human existence. It was as easy to travel a hundred miles in the time of Cæsar as in the time of Washington. It was as easy to transport freight in Italy in the early years of the Roman Empire as in America in the early years of the Republic. The mechanical equipment which the Western nations have acquired in this century is transforming the face of the earth, readjusting the relations between nations, and bringing forward most of the new social problems which this generation has to face.

Important among the new social problems are those that are presenting themselves in connection with the large cities. The most vital of these are such as arise from the fact that the population of the cities is increasing more rapidly than the population of the country. This condition of things is due largely to improvements in transportation that have been made in this century. When the transportation of food products was difficult there were many small markets. Except where there were opportunities for carriage by water, many small towns drew to themselves the products of a limited surrounding region. The value of most of these products was not sufficient to cover the expenses of carrying them a long distance by land. All the ordinary articles of food had to be consumed near the place of production. They were gathered in local markets, and in these markets they were very cheap when the harvests of the surrounding regions were plentiful; and

they were dear when the crops of these limited regions failed. They were dear because of the expense of bringing heavy articles from distant points. But in fertile districts where crops seldom failed, prices were generally low; and the cost of living in the small towns or in the country was very little in comparison with the cost of living in the large cities.

The development of cheap and rapid transportation has changed all this. When it costs no more to carry corn and potatoes and beef two hundred miles than it formerly cost to carry them twenty miles, there arises a large market in place of the many small markets. The city becomes a great market, supplanting the many small markets, each within its limited district. Instead of being the place where food was dearest, the city has become the place where food is cheapest. It has become a great food market, a distributing point for a wide region, and consequently a market with a comparatively low and stable price. It costs less to procure food in San Francisco than in any of the surrounding towns; and this is typical of the relations existing between the city and the country town wherever the modern system of transportation has been developed. By this change the main hindrance to the growth of cities has been removed. Futhermore, by the development of systems of municipal transportation the habitable area of cities has been greatly extended. By this means also the rent of houses has been kept low, thus removing another great obstacle to living in cities.

At the same time that these economic obstacles have disappeared, the attractions of city life have been greatly increased. With the new means of lighting which modern inventions have furnished, all social amusements have acquired a new attractive power. The gorgeous and brilliantly lighted saloon is a much more agreeable place than the store of the country town, dimly lighted with tallow candles or a malodorous lamp. The theatre, with its beautiful scenery, its brilliant costumes, and its spirit

of fun and jollity makes a strong appeal to the uncritical part of the inhabitants. The public library, with its accumulated literary treasures, puts into the hands of the ordinary man in the city what the wealth of kings could not have purchased three centuries ago. And the municipal museum, with its store of pictures and statues, makes the dweller in the city the heir of all the artistic ages.

It is under influences proceeding from these sources that the modern city has outgrown the country; and in the course of this growth it has presented certain new social problems. The first of these problems concerns the government. When the foundations of our government were laid, the city was an unimportant factor; and the founders had in mind a sparse country population and the inhabitants of small towns. To-day cities dominate the country, and the small town is putting on the airs of the city. The conditions of the present were not contemplated in planning our political structure. The striking inequalities of wealth which exist in our great cities were unknown. Neither the very rich, nor the great multitude of dependent workers had appeared in that Arcadian society. Democracy became our ideal, and it was very nearly realized in the local government of the township. The ideal was suited to the conditions; it was, in fact, a product of the conditions then existing. But the conditions have changed, and the problem before the coming generation, the new problem, is to determine how to preserve the spirit and virtue of democracy, and, at the same time, to create and operate a government that shall bring to the great city peace and prosperity and a harmonious development, in spite of the clashing interests, the rankling jealousies, the snobbish arrogance of the rich, and the reckless resentment of the poor.

In another view the great city presents a problem more far-reaching and, perhaps, more difficult of solution than the problem of government. I refer to the problem of so ordering the conditions of city life that the tendency of

permanent residence in the city will be towards a continuous improvement in the family stock rather than towards its deterioration. At present it is an ascertained and acknowledged fact that after three or four generations of continuous residence in a great city families show distinct characteristics of degeneracy. As a consequence of this, the great centers of population are able to maintain a high standard of morality and intellectual prestige only by drawing a new supply of inhabitants from conditions more favorable to the development and maintenance of a sound physical and mental constitution. The continuous progress of the city depends on the possibility of continuous drafts of the best from the country. Undoubtedly the circumstances of city life act as a tonic on those who are strong, and who come with trained powers. The city stimulates, but it does not create; it excites, but it consumes. The latent powers that might have remained forever unexpressed under the circumstances of the village or the country are unfolded in the stimulating atmosphere of the city, and here make their contribution to the higher phases of social development. But they are wasted in the process. The strong are, however, not the only ones consumed. The weak in the city are like the moth at the lamp. They flutter in the light for a moment, but are ultimately burned. The result of their living is the pleasurable excitement of their individual experience, and a multitude of kindly offices performed within the limits of narrow lives.

If the city is outgrowing the country, it follows that it is constantly demanding more strong recruits from the country while there are relatively fewer to be had. If, moreover, the circumstances of the city, in the long run, make for deterioration and degeneracy, it is clear that our so-called highest forms of society have in them the seeds of death; and that the relative depletion of the country, or the failure of the population of the country to grow as fast as the population of the city, indicates a cause and the process of decay. It might be rash to affirm that here is

the sickness of which nations die; yet it is difficult to refuse to acknowledge the force of this suggestion when we recall the fact that the decline of Roman society was preceded by a gradual withdrawal of the free men from the country to the cities; or when we observe that the Oriental empires of western Asia seem to have lacked stability by reason of a marked concentration of the inhabitants in the great cities. And one of the symptoms of Spain's disease is that her fields are deserted, and that there is no adequate country population from which the cities can be recruited.

The social problem which appears from this point of view is to discover how the fires that consume the generations of the great city may be extinguished, or how the country may be made to produce more men to be consumed in the cities, that our brilliant civilization may be kept aflame.

It is not merely the gathering of the population into great cities, but also the gathering of the wealth into comparatively few hands that has given rise to new social problems. The drawing together of capital, like the drawing together of persons, has one of its causes in mechanical invention; for progress in the mechanical arts has made it possible and profitable to carry on industry and commerce on a very large scale. Individual owners of capital have not been willing or able to venture in a single undertaking all the capital that was necessary to make the business the most profitable possible. Combinations of capitalists have, therefore, been found to be an economic necessity. The force that has brought about this primary combination, organized as a corporation, has brought about the secondary combination, or union of corporations, organized as a trust. The trust may be obliged to assume the organization of a corporation, but this will not interfere with the attainment of its original purpose. The corporation has come into existence to satisfy the universal desire underlying economic activity, namely, the desire for gain; and it has come at a time when it was clearly seen that by operations on a large

scale this gain could be more surely and more rapidly acquired than by the ancient method of individual industry and commerce.

Machinery exists because it saves labor, and thus reduces the cost of production. Large combinations of capital exist because, with a given amount of capital employed in this form, a larger product may be had than by causing the capital to be distributed among many individual enterprises. The corporation, or the trust, is a capital-saving device as machinery is a labor-saving device. Because of the economies of production on a large scale, it becomes possible to furnish wares to consumers at a lower price under the corporate organization of industry than by any other means. And on account of this fact, the corporation appears to have as legitimate a place in the economic organization as the locomotive or the power-loom. The problem of the corporations and trusts is, therefore, not to discover how they may be abolished, but how, as artificial persons, they may be made to occupy their legitimate place in society; or, in other words, how they may be made to obey the law in the same manner as the individual person, and thus become beneficent agencies of social progress.

But the mere statement of this problem raises others. One of these concerns the ability of a popular government to control corporations, in view of the fact that the bulk of the citizens who determine the policy of the government are interested in having the corporations uncontrolled. In this phase the problem of trusts, or corporations, appears to be a political and not an economical problem. When the popular government of America was established, only the individual person was prominently in view; and hitherto the government has found no difficulty in subduing this kind of a person, however obstinate and refractory he may have appeared. But with the artificial, corporate person it has not been so successful. The problem, therefore, at this point is how to increase the administrative power of the government and the will of the government to such an

extent that it may be able to hold, and wish to hold, all corporate persons in steady control, without laying aside that just leniency towards the individual, which is necessary to the maintenance and development of liberty.

The strong drift towards the corporate control of industry and commerce provokes inquiry concerning the fate of the individual man under this movement. Every step in the aggregation of capital and the centralization of control, brings a larger percentage of the population into positions of dependence. There was, probably, never a period before this when relatively so many of the citizens of this country were engaged in carrying out plans originated by others. The stipend or wages class is larger to-day in this country than ever before. The petty shop-keeper has become an employee in a department store; the manufacturer on a small scale has been absorbed by the trust. In every line of business the few are taking the initiative and making the plans, and the many are executing these plans. The social problem which arises here concerns the effect of this increasing dependence on the welfare of the individual citizens, and on the prospects of the republic.

As it regards the welfare of the individual, the problem presents the alternatives of an assured salary and a subordinate position, on the one hand, and an uncertain income and the position of an independent proprietor, on the other hand. There is here raised an inquiry concerning the freedom of the salaried employee from the worrying calculations and responsibilities of the small proprietor. This freedom is balanced against the endless cares of the petty shop-keeper or manufacturer, who has to face the fact that ninety-five per cent. of his class fail. Some account must also be made of the opportunity which the employee enjoys of having a partial view at least of whatever lies within the horizon of the corporation with which he is engaged. By this means he is brought to entertain larger ideas than those which come to the mind of the small proprietor, whose business makes exacting demands of

time and attention, and thus tends to make the horizon of his thought as narrow as the field of his enterprise. In this problem there is involved, moreover, a consideration of the modification of the institutions of the Republic that may come as a consequence of an increasing number of citizens falling into positions of economic dependence. When the bulk of the citizens occupy such positions, we have clearly departed from the original conditions of the free and independent life which characterized the beginnings of the nation. This division of the population into a large number of employees and a relatively small number of employers establishes a new relation between the society and the government. If the employing and the employed classes work in harmony, the employees will be moved by their sympathies to follow more or less closely the known political wishes of their employers. If, on the other hand, these two classes are not in sympathy with one another, the antagonism between them will necessarily have a certain political effect, and will cause to appear some of the characteristics of a house divided against itself. In either case there is a departure from the original independence of the citizens and the anticipated conditions of suffrage.

In connection with the problems raised by the observed increasing economic dependence of the citizens of this country, there appears another question even more important. I refer to the question of the ability of all independent persons to retain their independence under the clash of the forces that free competition has brought into play. In spite of the prominence given to the idea of equality during the last century and half, no fact is more evident than that men are not equal, either with respect to their intellectual powers, or with respect to the dignity and worth of their moral purposes. The law may seek to deal impartially with all under its authority, yet the fact remains that these persons are the possessors of widely different powers; and it is evident that men with different abilities placed under circumstances affording common opportunities will derive

unequal advantages from those opportunities. In this is seen the first step towards practical inequality. Here is revealed the first movement towards the widely diverging conditions of men; and as long as freedom of action is maintained, and men continue to be endowed with uneqnal powers their conditions will continue to diverge. Freedom of inheritance and free competition accentuate the misfortunes of the weak, and promote the advantages of the strong. The handicap of the hindmost becomes relatively heavier with each succeeding generation; until, by the very force of unequal abilities operating under freedom, the weak are driven so far towards the wall, that we are forced to inquire whether under the relentless competition of thorough freedom they may be able to maintain themselves.

This is a new problem. It is a problem of the later centuries, and particularly of this century; for in no other period has the individual man appeared with so little extraneous support. In previous ages he was hedged about with customs and traditions and laws. Under the customs and laws of feudalism no man stood alone. All were bound together by a system of mutual obligations. The vassal served his superior, and the superior was under obligations to protect the vassal. The relations among the different members of society were not determined by a freely formed contract, but by customs and rules which the members most vitally affected had small hand in making. And when feudalism as a form of social organization was set aside, much of the spirit of feudalism survived. Laborers, although nominally free, continued to hold a personal relation to their employers, and the employers recognized that their superior position carried with it certain moral obligations. But in the characteristic society of the present, with its impersonal employers and its warlike laborers, the ancient customs and traditions have fallen away, and the several members stand forth, without hereditary claims for protection or hereditary obligations of service, in the nakedness of their individual power or weakness.

This problem, stated in a few words, is, can the free man remain free? In a society which seeks to realize the complete individuality of its members, and is moved by the merciless forces of competition, will it be possible for our ancient ideal of personal independence to be maintained? Will the conditions here existing, in the course of time, through the differentiation of the strong and prudent from the weak and imprudent, tend to produce some form of superiority and inferiority? It may be doing violence to our traditional thought as Americans to raise this question; yet the natural differentiation of society in the process of growth, the present struggle between the employers and employed for domination, and the willingness of crowds of laborers to believe they are being oppressed by their employers constitute a sufficient ground for the assertion that such a question exists. This question is, moreover, warranted by the fact that every society whose historical progress we can trace has produced a class that has pretended to superiority, and another class that has been obliged to acknowledge its practical inferiority. The problem, then, is to determine whether under the forces existing in our society the practical position of the individual man will remain as independent as we have been accustomed to think ourselves, or whether some new form, or system, of mutual obligations must arise to prevent the weak and ineffective from being overridden and cast out as a rejected mass of human rubbish.

This has not long seemed to be a serious problem; for we have been accustomed to think of law as a powerful transforming agent, sufficient to cause to appear in practice the condition at which it aims. If the law affirmed the equality of all men, it has been presumed that they would be so in fact. If the law affirmed that men had a right to occupy a certain position in the affairs of a community, it was taken for granted that they would occupy that position. In this there has been simply an over-estimation of the reformatory, or creative, power of law. But we are

beginning to learn that law has comparatively little power to make new conditions. Mexico established and has maintained a constitution which organizes a liberal federal republic after the model of the federal republic of the United States. Yet this law did not transform the conditions of that country so that a federal republic would be the normal expression of its political spirit. The Mexican government is not what it is by the force of this law. On the contrary, forces in the society which the law has thus far been powerless to modify have determined the character of the government. The law stands, but the spirit of the law is ignored; and the more or less benevolent despotism that has grown up in that country, to pacify and to bless the nation, is not the product of a constitutional law borrowed from the United States. The law provides for a federal republic, but the real character of the government is what it is made by other forces than the law.

Furthermore, after the civil war, we attempted, by a simple legal enactment, to make several millions of recently emancipated slaves independent and effective citizens of an enlightened republic. We seemed to believe that men in massess could be lifted from barbarism to civilization by a simple declaration of the law. After centuries of absolute dependence, with no traditions of responsibility, with no training in the business of government, it was proposed to thrust them into positions where they would be charged directly with the highest interests of humanity. The law was to work the miracle. But the miracle has not been wrought. Those members of the society whose antecedents were those of civilization have been constrained to attempt to uphold the achievements of their ancestors; and in the emergencies of the situation they have often demanded that the law should be silent. They have met the crimes of barbarism with a method and a punishment that might be supposed to impress and deter the barbarian.

As it regards the problems of the Southern States that

have arisen from the presence of two distinct and antagonistic races, they are not much nearer a solution than they would have been if no attempt had been made by law to determine the relations between these races. The conspicuous events in the social affairs of that part of the country are phases of a struggle through which society is seeking the solution of a very grave problem. The unrest and the barbarities that mark life in that region are evidence that the solution attempted by legislation has not been found satisfactory as a final determination of the race problem. But it does not yet appear what the conclusion will be. After thirty years of freedom, the black race has not won the confidence of the white men, and the white men have acquired a new form of antagonism. It is clear, therefore, that the problem which we have expected would solve itself under a legal enactment, has made little progress in that direction. Instead of this, the question of the white man's relation to the negro in the South is merging itself into a new phase of the larger unsettled question of the relation of the white man to all other men of whatever color. This is one of the serious inquiries of the present age. It concerns the relation which the white man is destined to hold to other races. By the outward movement of the English, this question has become especially conspicuous, and it is raised wherever Europeans have established themselves beyond the borders of Europe. But where only a sparse and savage population has been encountered, its more serious aspects have not appeared. Here the solution has been simple; the aborigines have been swept away. But the outward movement of the English people has not ceased when all lands with a sparse population have been appropriated. Regions with many millions of inhabitants have been overrun, and here the new problem arises. Here the inhabitants are not savages, nor are they few in number, nor can they be exterminated. They are destined to live, and the white race is destined to live with them. And because this is true, we are bound to inquire what

must be the relations between these two elements, in order that their coöperation may most surely promote the highest interests of humanity.

Before the English settlers in America and Australia, the inferior race disappeared; it was doomed by the fact that the English had no mind for amalgamation, and the aborigines could not rise to the English standard. But in India and the Philippine Islands the original inhabitants will remain and continue to multiply, thus raising the new problem and making it imperatively necessary to find some basis on which the two races may advantageously live together. This is not a theoretical problem simply, but a problem of vast practical import; and its importance is likely to increase in view of the fact that the white race, in its later expansion, must move upon densely populated territory. There are no more sparsely settled continents to be discovered; at the same time it is not to be expected that, after a thousand years of marvellous expansion, the Anglo-Saxon people is suddenly to lay aside its habits, and manifest no longer a disposition to run over its borders. A people, like an individual man, that has grown to maturity, and developed strong instincts under a certain line of conduct, is not likely to lose these instincts, or to lay aside its hereditary impulse, in view of the possibility of giving a wider range to its normal activity.

The solutions that are offered by the experience of other times are not applicable. The previously executed English plan of sweeping away the aborigines cannot be carried out here. The Spanish plan of mingling the blood of the white and the colored races encounters grave objections: it is not agreeable to the English mind; it causes the higher civilization to be lost in a lower; and it produces a mongrel people that is able to reach the white man's estate only after centuries of painful effort. The plan carried out in the Oriental rule of provinces may not be followed, because it violates our worthiest political traditions, and defeats our highest social purposes. If some of the data of this

problem have appeared earlier, the problem itself is, nevertheless, new, because our new ideals lead us to demand a new result.

These are a few of the problems the present generation has to face. They are fundamental in the study of contemporary society, and important as involving our social policy. When they shall have been solved, others more numerous and more difficult will arise, and thus onward till man gives up the attempt to remain civilized. The task of civilization is an ever-increasing labor. A nation may be proud of its past and satisfied with its present, and retire before this growing undertaking. This is the beginning of national decay. The only hopeful alternative is found in the earnest and vigorous devotion of mind and heart to the business of our common life.

THE LIVING PLANT IN NATURE STUDY.*

By W. J. V. OSTERHOUT.

It seems to be generally admitted that plants are especially suitable objects for nature study but it is to be regretted that too often the attention is centered on the dead plant to the exclusion of the living one. This is a mistake and will be recognized as such if the aims of nature study are not lost sight of. These are, first, to put the child in the right attitude, to awaken his sympathetic interest in plant-life and, second, to develop his observing and reasoning powers in leading him to find out for himself what the plant is doing and why it does it. Both these objects may be admirably attained by experiments performed by the children themselves on living plants.

Experiments should not be performed in a haphazard manner, nor—as usually happens—to demonstrate something the child has already accepted as a fact; but to answer questions which have been previously put by the child himself or by the teacher. I believe this point to be of fundamental importance, although generally overlooked. Experiments seem to be usually regarded as useful for demonstrative purposes only. I do not believe that, for nature study at least, this is the best use to which they can be put. The child can use experiments for the same purpose as the investigator uses them, *i.e.*, for putting questions to nature, and will find in this a mental

*Address delivered before the California Teachers' Association at Sacramento, December 29. 1899. Illustrated by drawings from nature by Mr. A. A. Lawson.

quickening and zest such as comes in no other way. Children are investigators, in their own way, and enjoy experiments of all kinds, especially experiments with things which are alive.

An enthusiastic and sympathetic teacher will easily get the children to ask questions; the next step is to show them how to answer their own questions by experiments, or, better still, lead them to suggest for themselves how to do this. Herein lies the value of the method. It leads the child to think; reveals to him his own power to find out things and creates an interest which does not die when he leaves the schoolroom. He gains, almost without conscious effort, an insight into plant-life which makes plants attractive and interesting wherever he sees them and which will surely entice him into the fields. He comes to see the plant in a new and wonderfully inspiring way, as a living, struggling being, attacking its competitors, warding off its foes, adapting itself by clever devices to harsh and unfavorable surroundings; in short, solving the thousand and one problems of its existence with consummate skill. And what he before passed over with apathy he will learn to observe, admire, and study; in some measure he will come to see the beauty and learn the lessons of common things.

Many teachers may approve of experiments, but shrink from what they suppose requires too much time and the use of complicated apparatus. I wish to point out that the most interesting and instructive experiments can be performed either with no apparatus at all or with such as the children can easily make for themselves and that the outlay of time and money are exceedingly small while the returns are of great and lasting value.

The experiments here described require no special skill and almost no apparatus. The few articles required will also serve for many other experiments. The necessary plants can all be grown on a single shelf in front of a convenient window. In this brief space I can mention only a few experiments, merely enough to give an idea of

the method. But it is the method upon which I desire to lay stress, since experiments are often performed in such a way as to be a source of confusion rather than of inspiration.

We shall do well to begin where the independent life of the plant begins, with the seed. Plants should be used which are familiar to everyone and which are easily grown and cared for. Some Scarlet Runner Beans may be soaked over night and given the children to examine, together with unsoaked seeds for comparison. How does soaking affect the covering of the seed? Do all seed-coverings* behave in this way? Try some hard, resistant ones, such as the Castor Bean, Buckeye, Acorn, and Peach or Cherry pits. Of what use is the seed-covering? Does it help the taking up of water? A simple way to answer this is to remove it before soaking and note the result as shown by the general appearance of the seed. Acorns are good for this purpose as the shells are easily removed and the seed is usually more or less shrunken and becomes plumper on taking up water so that the effect can be easily noted. How does the water get through the seed-covering? Select some well soaked Scarlet Runner Beans. Wipe them perfectly dry on the surface. Now squeeze the seed. Does water ooze out? Where? Does this hole in the seed-covering allow water to enter? Can you find it in other seeds? Can water get into the seed except through this hole? Take some unsoaked seeds. Fasten them in a piece of split cork so that when it floats in the water the seeds will be half submerged. Let the hole in the seed-covering be well above the water and take care to keep it perfectly dry. If the seed takes up water in this position it must be through the seed-covering itself. It is interesting to use seeds with hard coverings for this experiment and to fasten some in the reverse position, with the hole under water, as a control-experiment.

Within the seed-covering is a tiny, sleeping plant.

*The term seed-covering is here used to include both seed-coats proper and other coverings from whatever source derived.

Notice its tiny leaves, radicle and seed-leaves (Fig. 1).

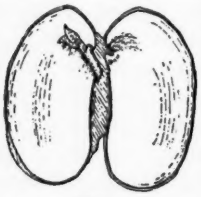

FIG. 1.

When does it waken? What is necessary to make it germinate and grow? Place some soaked seeds in damp sawdust and keep one lot on ice and another in a warm place. Place some unsoaked seeds in dry sawdust and keep others immersed in water which has been boiled for the purpose of expelling the air and then allowed to cool. On the top of the water a film of oil may be placed to prevent absorption of air. Which lot of seeds germinates? What prevents the others from doing so? Water, air, and a certain amount of heat are necessary to awaken a plant from its sleep. How long will plants keep alive waiting for a chance to germinate? Do some seeds respond more quickly than others when the right time comes? Is this an advantage to them? When a plot is sown for a lawn, what plants come up first, the grass or the weeds? Are weeds apt to be quick starters? Does this help to explain their success in crowding out other plants? We should remember that there is a constant struggle going on among plants for light, because if a plant be shaded too much it cannot live. The plants also crowd each other and struggle for room both above ground and below, where the interlacing roots are eagerly competing for the nourishment in the soil.

When the awakened seed starts to grow, it must first get out of its imprisoning seed-covering. When the covering is tough and hard, it requires considerable exertion to get out. Notice how the seed swells. Does it exert much force on the seed-covering in swelling? We can gain some idea of this if we put as many seeds as we can into a thick-walled bottle and immerse it in water over night. When morning comes the bottle will be found in fragments. Occasionally a ship, laden with rice or grain, founders or runs aground where the waves break over her, and the swelling seeds burst her in pieces just as they do the bottle.

In the Scarlet Runner where do we find the first rupture of the seed-covering? Is there any reason for its occurrence in this particular spot? Remember that the radicle and the hole in the seed-covering are both found here. Is this so in all seeds? Is it any advantage to the radicle to double itself up as in Fig. 2A? Why? Notice how it behaves as soon as it is free (Fig. 2B). What part of the seed grows most rapidly? Do the seed-leaves grow at all? What has split the seed-covering across in Fig. 2B?

FIG. 2A.

FIG. 2B.

Notice how hard are the coverings the little plant must break through in the Buckeye, the Peach, and the Cocoanut. Would it not be a great advantage if the covering were made softer or less resistant at the spot where the plant must break through? Can you discover anything of this kind? The "eyes" of the cocoanut are softer places in the shell; the peach stone splits easily along the edges. Peach stones take so long to germinate that we will study the squash instead. Notice where the seed splits (Fig. 3); notice also a peculiarity of the squash, a small projection known as the "peg" which grows out just at the right place on the stem. Can you see of what use this peg is? To watch a squash wriggling out of its shell reminds one of the way a man pulls off his boots and the peg corresponds to the man's toe when he makes it serve as a bootjack (Figs. 3 and 4).

FIG. 3.

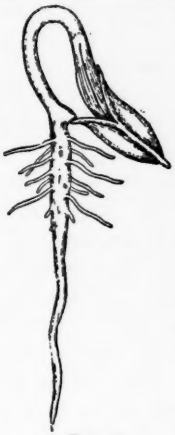

FIG. 4.

As soon as the plant is fairly out of the seed-covering, the root begins to bore its way downward into the soil. Have you ever noticed what a hard time the roots have in getting into the ground when the seed happens to lie on the surface? Put some seeds on the surface of moist soil and cover them with a funnel (with a little cotton-wool in the neck to retain the moisture and admit air) or with an inverted wide-mouthed bottle, or, better still, with a bell jar. At first when the root starts to bore downward into the soil it only succeeds, in many cases, in lifting the seed up from the earth. How does the plant overcome this difficulty? If you look closely you can see a host of tiny thread-like hairs growing out from the radicle and anchoring the plant to the soil, thus enabling it to penetrate into it.

Have you ever thought of the difficulties plants have when the seeds are buried deeply underground and on awakening and bursting their seed-coverings they find a load of earth which must be struggled through or pushed aside before they can reach the light? Should you think this would be a serious obstacle to overcome? Plant some Scarlet Runner Beans in three different pots, one, two, and three inches deep respectively, packing down the earth well above them. Thrust a smooth flat piece of wood into the soil beside each lot and write on it with a soft lead pencil the date of planting. Note the date on which the first plants of each lot appear above the ground. The plants which are deepest in the soil may never come up at all; or if they do, they may creep up along the sides of the pot where the earth has shrunk away and left a crack. Or sometimes they will lift up the whole mass of earth above in a round, solid cake and thrust it bodily out of the pot. After witnessing a feat like this we are more ready to believe in the tales of mushrooms raising flagstones and the like. We may test the strength of each plant individually by a very simple contrivance. Take a small light glass funnel, (if this proves too heavy one of tin may be used) close the end with a cork and thrust the neck through the bottom of

a small pasteboard or paper box. This should be placed over the plant as it emerges from the ground and shot may be poured into the box until the plant is barely able to raise the load.

Notice how much more easily some plants come up through the ground than others; the Corn-plant, for instance,

FIG. 5.

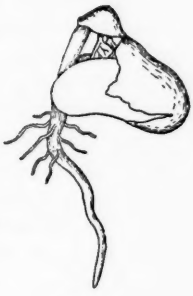

FIG. 6.

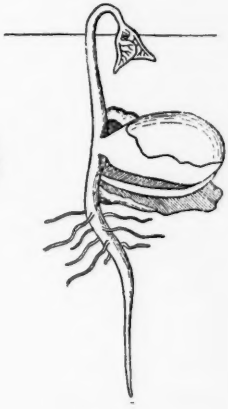

FIG. 7.

(Fig. 5) rolls its leaves up into a sharp, slender awl which seems to pierce the soil with ease. But the Scarlet Runner (Figs. 6 and 7) is very clumsy on account of the crook in the stem and must lift a much greater load. Sometimes it pushes up great lumps of soil when it comes to the surface. What is the use of this crook in the stem? Let us look also at the common Bean and at the Castor Bean (Fig. 8) which does not get out without a struggle which reminds us of an athlete straining every muscle. Can you tell why the Castor Bean has so much trouble?

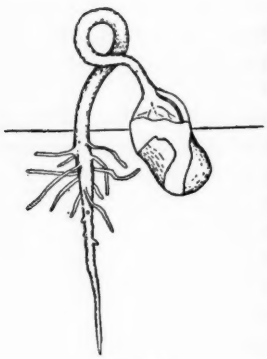

FIG. 8.

Let us now notice what the plant does when it gets above ground. The Scarlet Runner straightens out the crook in its stem and points its tip straight upwards. Soon the new leaves grow larger and we see clearly that they are not at all like the seed-leaves. Notice all the differences that you can. Here are some of them:—Seed-leaves: under ground; pale yellow; small and thick; shrivel and grow smaller for some time, eventually fall off. Foliage-leaves: above ground; bright green; large and thin; increase in size for some time, remain on the plant.

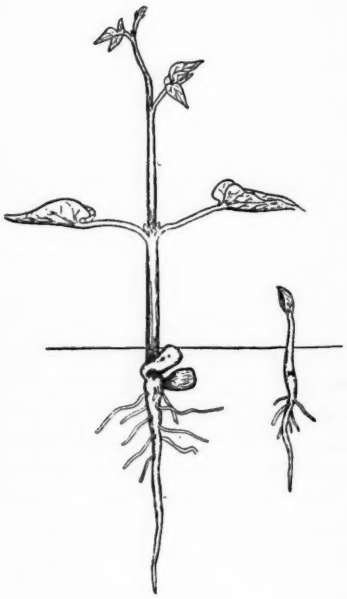

FIG. 9.

What is the reason for all these differences? Of what use are the seed-leaves? Perhaps the simplest way to answer this is to cut them off and see how the plant gets along without them. Select several plants (about an inch high) growing in a pot. Remove the seed-leaves from one-half the number and tie pieces of white twine to the uninjured plants and red twine to the others to

distinguish them. In a few days you will see a difference; later on this will be much more marked (see Fig. 9). It would seem that the loss of the seed-leaves stops the growth of the plant. Why is this so? We see that the longer the seed-leaves remain on the plant the more they shrivel; *i.e.*, the more substance they lose. We cannot help thinking that the plant is taking this substance from the seed-leaves, especially when we find that the principal substance in the seed-leaves is starch, a very important food-substance for plants. How do we know this substance is starch? By means of a very simple test which you may try for yourselves. Break a seed-leaf in two and put a drop of iodine solution on the broken surface; if it turns dark blue (or black) it shows that starch is present. Test a little commercial starch in the same way. This test is so simple and certain that we can use it whenever we wish to know if any part of the plant contains starch.

I think we now know the use of the seed-leaves. What is the use of the foliage-leaves? Do they also contain starch? Let us test them as follows: Let the plants stand in as strong light as possible during the day; toward sundown remove some of the largest leaves, boil them (in order to kill them and swell the starch) and put them in alcohol over night. In the morning they will appear bleached, as the alcohol has extracted the green color. Dissolve in water some crystals of potassium iodide and add a few flakes of solid iodine to the solution. Place the leaves in the solution and if they do not turn dark at once leave them for some hours.

How do the foliage-leaves get their starch? Do they get it from the supply in the seed-leaves or do they make it themselves? Let us see if we can answer this question. Keep a plant in darkness two or three days; test the leaves for starch. If none is found, remove several leaves from the plant, putting one-half the number in darkness for a day or two and the rest where they will get as much light as possible. The leaves must be placed in water; be sure

that the stalks dip well beneath the surface. After a day or so test the leaves which have been in the light. The starch which we now find in the leaves must have been made by them *after they were removed from the plant*. Now test the leaves which have been kept in darkness all the time. Why is there no starch in them? Is it because they have been kept in darkness? We may put this to a final test in a very simple way. Fasten corks to opposite sides of a leaf, (as shown in Fig. 10) so as completely to exclude

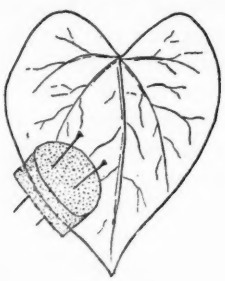

FIG. 10.

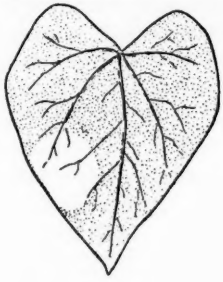

FIG. 11.

the light from the covered portion. The leaf must not be removed from the plant and should be placed where it will get plenty of light. In a day or so test it for starch; this is found everywhere except in the covered portion (Fig. 11.) It would seem that lack of light alone has prevented this part of the leaf from making starch. Foliage leaves, then, have the power of making starch; but they must have light in order to do so.

Now what is the use of this starch in the foliage-leaves? Is it absorbed by the plant like the starch in the seed-leaves? If so, ought we not to find less starch in the leaves in the morning than at night, since the making of starch stops at sundown and what is taken away during the night cannot be replaced until the next day? Test some leaves at sundown or a little before; now place the plant in a dark box or cupboard, and in the morning test again. We find the starch

has almost or quite disappeared. Would it have done so if the leaves had not been on the plant? Take some leaves which contain plenty of starch; remove them from the plant and put them in a dark box or cupboard. The stalks should dip well under water. In a day or so test them for starch. They have not lost any. It seems then that *foliage leaves produce starch and the plant absorbs it from them.*

It is now time to see whether we can answer the question asked a little while ago, Why are the foliage-leaves and seed-leaves so different? You can see that it is of advantage to the plant to have the foliage-leaves remain as long as possible on the plant. You can also see why they should have as large a surface as they can, since the more light they catch the more starch they can make. You can see, too, why the seed-leaves need to be thick and bulky so as to store up a great deal of starch. Perhaps you do not see why the foliage-leaves are green and the seed-leaves pale yellow. You will understand this if you put a few seeds into a pot containing soil or sawdust and keep it entirely in the dark until the plants are several inches high. The plants grow very tall and slender and the leaves are small and yellow, in color resembling the seed-leaves. Put the plants in the light for a day or so. Test them for starch. None is found. Leave them in the light until they turn green. Then test for starch. Does the result indicate that the green substance is necessary for making starch? It is this substance, called chlorophyll, which is extracted by the alcohol when you test the leaves for starch. Usually it is not formed in darkness. Do you now see why the seed-leaves are not green? Remove some of the earth so as to expose them to the light. Do they turn green?

The seed-leaves and foliage-leaves are different because they have different tasks to perform and their structure must be adapted to the special kind of work they have to do. We may sum this up by saying, *function determines structure.* When we see how different the seed-leaves of

the Castor Bean are from those of the Scarlet Runner, for example, we at once suspect that their tasks must be quite different. Notice how thin and delicate are the seed-leaves of the Castor Bean (Fig. 12). Where is the food stored in the Castor Bean? Not in the seed-leaves but around them, and their task is merely to absorb it. See how closely they are attached to the substance they are absorbing. Cut away the food substance carefully, so as not to injure the seed-leaves. Does this check the growth of the plant? After the seed-leaves get above ground they are called upon to do still another kind of work. What is it? Do they change their appearance correspondingly? (See Fig. 13). Do you know any other seed-leaves which are absorbing organs instead of storehouses—any which are both? (See Fig. 5.) Do you know any other seed-leaves which come above ground and help to make starch?

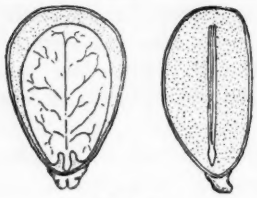

FIG. 12.

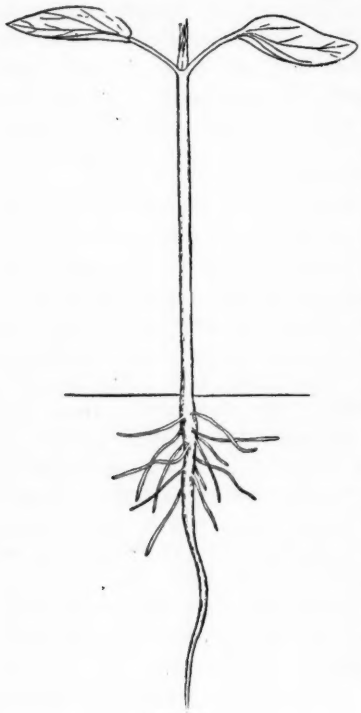

FIG. 13.

Every part of the plant has its work to do and its whole structure is expressly adapted to this work. Notice the root, for instance. See the multitude of tiny hairs which help it to absorb water and food. Where the root is covered with these hairs the absorbing surface is ten to twenty times as great as elsewhere. Notice the root-cap which protects the delicate tip as it is driven downward into the soil. (Roots allowed to develop between pieces of moist blotting paper show the hairs well; cuttings of Wandering Jew placed in water develop roots which show both the cap and the hairs admirably). Is the root driven down into the soil with much force? We may find out by a very simple contrivance. Remove the top and bottom from a shallow wooden box. Replace the bottom by wire-netting with meshes about one-quarter of an inch square. Cover this with a piece of tin-foil and on this place enough earth to fill the box. Place seeds in this and suspend the box at a convenient height so that when the roots come through the bottom they can be easily observed. How thick a piece of tin-foil will they penetrate? Try different kinds of seeds.

What drives the root downward with so much force? Why are not the side roots torn off as the root moves downward? We may answer both these questions by marking a root with ink-dots (waterproof ink is best; it should be put on with a small brush) about one-sixteenth of an inch apart and allowing it to develop in water.* We shall then see the marks separate near the tip, showing that the root is elongating there, while higher up is a region where they do not separate. It is only in this upper region that the side roots come out.

Does the stem have a similar elongating region? Where are the new leaves formed? What would happen to the stem if this elongating, formative region were removed? Select Scarlet Runner seedlings about two inches high

* Tie a piece of cheese-cloth over the mouth of a tumbler; thrust the root through it; pour in water until the seed-leaves are partly submerged and invert a second tumbler over the first.

(above ground) and cut off the stem below the first pair of foliage-leaves. In a few days you will see new stems or branches starting out. Where do they appear to come from? (See Fig. 14.) In a short time these will be followed by others until a dozen or more are growing up to take the place of the one which has been removed. Try the same experiment on other kinds of plants. Now let us remove the elongating region of the root and see what will happen. Do new roots come out? Where? Do they grow horizontally like the side roots or straight downward like the main root? The roots should be allowed to develop in water so as to be easily observed.

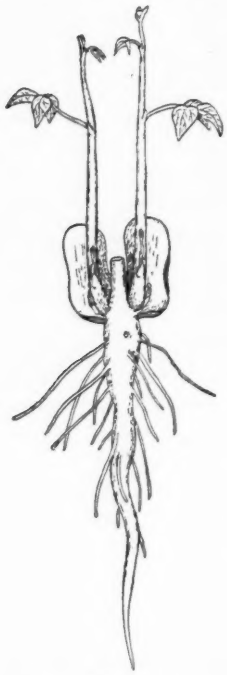

FIG. 14.

Does the main root always grow straight downward? Try placing the seed in various positions to see if this affects the direction of growth. The seeds may be placed on the surface of moist earth (and covered as described above) or may be pinned on corks in various positions and the corks may float on the surface of the water in a shallow dish. A little cotton laid over the seed-leaves and dipping in water will keep them moist. After the root has grown a little, change the position of the seed so that the root points straight upward or is horizontal. Does it begin to grow down again? Why does the main root persist in growing downward no matter in what position the seed may be placed? The idea has been put forward that the root tip not being very rigid droops downward of its own weight, and this starts the growth in the right direction. This

idea can be tested by a very simple experiment. In a small glass dish place some mercury; split a cork and fasten it to the side of the dish (Fig. 15). To this pin a germinating seed with a perfectly straight radicle about an inch in length. Place the radicle in a horizontal position and resting on the surface of the mercury. Pour on enough water to partially submerge the seed. In a few hours the root-tip will bend downwards and penetrate the mercury, overcoming its resistance (Fig. 15).

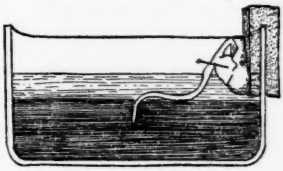

FIG. 15.

It would seem that gravity must determine the downward growth of the root. Now, if this be so, what would happen if we make the force of gravity of no effect by placing the seed on a revolving wheel? If the wheel turns always at the same rate, each side of the root will feel the downward pull of gravity for a short time, but no side will feel it more than another. So when all sides are equally affected, will the root have any tendency to bend in one direction more than another? Let us see. The construction of the wheel is a very simple matter. Have a plumber or tinsmith cut out of thin sheet zinc a circular piece six inches in diameter. Have this cut to allow the insertion of corks as shown in Fig. 16. Let the flaps made by cutting remain in place. . Fix round, flat corks in the cut places, and bend the flaps so as to support the corks as firmly as possible. For the axle use a knitting needle, impaling two rubber corks upon it, one on each side of the zinc disc (Fig. 16, A) to hold the latter in place. They should press firmly against the disc to insure its turning with the axle. Two upright wooden supports fastened to a block of wood are pierced by holes just large enough to admit small glass tubes in which the axle rests. One of these (Fig. 16, C) is closed at one end to keep the axle from slipping too far; the other (Fig. 16, B), being open at both ends, allows the axle to pass through, and (being bent at a right angle as shown in

the figure) to be fastened by fine wire to the minute-hand of a clock. This apparatus, which almost anyone can easily make in a little while, permits of some exceedingly interesting experiments, and answers the purpose as well as a costly instrument. Select some peas with radicles about half an inch long; partially envelop each one in wet cotton

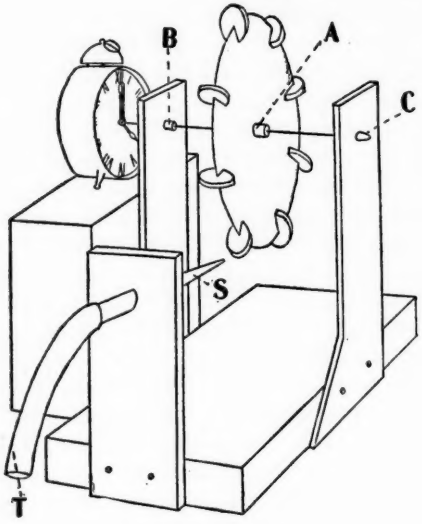

FIG. 16.

and pin them upon the corks. Arrange a saucer of water so that as the wheel revolves the seeds will dip into it and be kept moist. The seed itself need not come in contact with the water, but a little strip of cloth or filter paper may be arranged so as to hang down from the seed and touch the water. The clock is set agoing and the wheel revolves once an hour. The seeds grow well under these conditions, but the direction of growth is no longer the

same for all the roots. Instead they may grow in almost any way. Often we see some of them turn and grow in the same direction as the stem. How do the stems behave? The directing power of gravity being removed, both stems and roots grow in quite haphazard fashion.

We may now go a step further and substitute a new force for that of gravity. This we may do by making the wheel revolve more rapidly. If you bend a piece of wire around the spoke of a wheel, so as to form a loose ring, and spin the wheel rapidly, the ring will be violently hurled to the rim of the wheel by a force commonly called centrifugal force. If the wheel be revolved rapidly enough the centrifugal force will be much greater than the force of gravity. Will a seed placed on such a wheel direct its roots in accordance with the centrifugal force? To test this we remove the clock and saucer, place the apparatus in a sink, and attach the rubber tube, T, to a faucet. At the end of this tube is a piece of glass tubing, S, drawn to a point. The manner in which this is supported is shown in the figure. It should be wedged firmly in place by wooden wedges, and be directed so that the stream will strike the wheel just at its rim. The stream must be powerful enough to make the wheel revolve rapidly. A piece of cloth must be put over and around it, like a tent, to confine the flying drops. In the course of a day or so, provided the wheel is turning rapidly enough, we shall see the roots all bending away from the center of the wheel and growing straight out in the direction of the radius, while, on the other hand, the stems grow straight in, pointing their tips toward the center of the wheel.

Let us see what will happen if we place the apparatus on its side so that the wheel revolves horizontally, the closed tube, C, being below. If the plants have become inconveniently large we may replace them by fresh ones with radicles about an inch long. Two forces now act on the plants, the centrifugal force and that of gravity. The roots take up an intermediate position, growing away from

the center of the wheel as before, but also obliquely downward; the stems grow in an exactly opposite direction.

These experiments lead us to think that when the root and stem issue from the seed, gravity determines the direction in which they grow. And so we can understand how the seed, whether above ground or below, unerringly sends its stem and root in the right directions. We can easily understand that this is a very important matter for the plant, for the quicker it gets its stem above ground, into the light and air, and its roots down into the soil to find food and moisture, the better will be its chances of living through this first period of its independent life, which is more critical and beset with dangers than any other.

The root goes down into the ground to seek for water. Sometimes we find drains or cisterns choked by roots which have grown into them from trees many yards away. This leads us to suspect that roots seek for water. Can you think of any way to test this idea? Here is a very simple one, but you may think of one equally good. A glance at Fig. 17 will explain it. The seeds have been

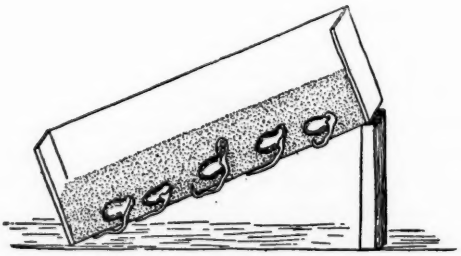

FIG. 17.

planted in damp sawdust, in a box with a bottom made of wire-netting. The roots, growing straight down at first, meet the dry air and turn back, some of them at least, to

the damp sawdust. In this case moisture seems to be more powerful than gravity in directing their growth, and we can readily see that this is of advantage to the root, since its function is to seek and absorb water.

Now the stem goes above ground to seek light. Does it have the power of growing toward the light as the root does toward moisture. Can you think of a way to answer this question? The easiest way is to cover the plant and the pot in which it is growing with a box, and make a hole at one side to admit light. Then if the plants have any tendency to grow toward the light, it ought to show itself.

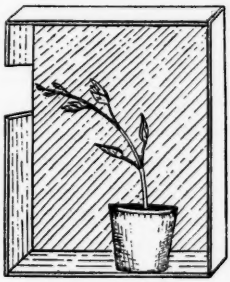

FIG. 18.

The result of this experiment is shown in Fig. 18; in this case a Scarlet Runner was placed in a wooden box, one side of which is removed to show the plant. Radishes are good for this experiment. They come up quickly and are very sensitive to the light. We must not forget that the whole object of seeking light is to expose the leaves to it. In what position will they catch the most light? Do you generally find leaves in this position? Observe all the plants you can out of doors to see how their leaves are placed. Notice especially plants growing near walls or houses, or in any position where they get the light from one side only. Do you find the leaves facing the side from which the light comes? Is this arrangement due to the light itself? Grow some Nasturtiums in pots and place them in a box which admits the light on one side only. When the leaves have all turned so as to face the light, turn the plant around so that they face away from it. How long is it before they begin to turn back again? Try them before a window in the same way.

The English Ivy (Fig. 19) is interesting to experiment with; but it takes too long to grow it in pots, so we will use a quicker method. Find some plants growing where they get plenty of light, and bending back some of the branches tie them so that the side that was shaded before now gets the light. How do the young leaves place themselves? On which side do the new roots come out? Where do the new leaves appear? Does this indicate that light influences roots as well as stems and leaves? The Nasturtium leaves turn to the light much faster than the Ivy leaves, but there are others which move still faster. If you watch the leaves of the Lupine, you will see that they follow the sun all day long, facing east* in the morning and west* in the evening. Can you find any other plants which do this? Are there any flowers which behave in this way?

FIG. 19.

It must be a great advantage to the plant to have its leaves following the sun in this way, for of course they must get much more light. But most plants must be content to have their leaves remain in one position, or at least move very slowly indeed. It is, then, all the more important to have the leaves placed in the most favorable way possible. If they are crowded one above another, they will keep each other from getting the light they need for making starch. Can you find any indications of a skillful arrangement for avoiding this? Look at a branch of the Chestnut (Fig. 20) or Ivy-leaved Geranium (Fig. 21) and notice how the leaves are placed. Do they shade each other? This arrangement has been called a leaf-mosaic. Do you see why? Can you explain how this clever arrangement is brought about? What are the best leaf-mosaics you can find?

*i.e., Northeast or -west, or southeast or -west, according to the season.

FIG. 20.

FIG. 21.

We have scarcely made a beginning of our experiments, yet they have already led us into the fields to study plants as we find them. Here there is always something of interest for eyes which have learned to see. With a little guidance the child learns to see more and more for himself, and strives more and more to see aright, to draw and describe things as they really are. So the love of nature leads him to the love of truth. These twin influences, upbuilding both mind and character, should come early to the child and be a lifelong inspiration.

THE CONDITION OF HISTORY IN THE SECONDARY SCHOOLS OF CALIFORNIA.*

By KENDRIC CHARLES BABCOCK.

The excellent paper to which we have just listened is quite beyond criticism save for its self-confessed incompleteness, and I shall therefore confine myself in the main to an attempt to supplement it. What I have to say is not based on any collection of statistics, nor on written information, but on careful personal observation of some thirty secondary schools in their regular work, and on conferences with men who have similarly examined the other secondary schools of the State. The schools which I have examined, many of them several times in the past three years, are all north of the Tehachapi, but I know of no good reason to suppose that these northern schools differ materially from those of the south. Let me make clear one fact: I am speaking personally and not officially, for myself and not for the Department of History of the University of California. It is not as a scribe nor yet as one having authority that I take part in this discussion.

The reports on which Miss Anderson has based her paper, cover the work of only seventy-three schools, and it is not quite fair to assume that the average of these would be the average of all the schools of the State. It would be

* Delivered before the California Teachers' Association, at Sacramento, December 29, 1899, in discussing a paper on this subject by Miss Blanche J. Anderson, of Stanford University.

necessary to know what schools were not on the list used before we could accept even the tentative conclusions. There are this year somewhat more than one hundred and twenty secondary schools applying to the University of California for accrediting; of these, every one applies in the subject of civil government, and all but three in at least one other subject in history. The paper just read deals with only three-fifths of the number. I believe its conclusions would be modified in several important particulars if returns had been made by all.

So far as the figures given relate to the subject of American history, they are apt to be misleading. That subject appears to receive only twenty-one and one-half per cent. of the time devoted to history, while Greek and Roman history receive thirty-six per cent. Perhaps this may be the average ratio at the present moment, though I am inclined to doubt its accuracy. But even if it does, it represents a passing condition. Beginning with the academic year, 1901–2, the entrance requirement for the University of California will be American History and Civil Government. This will probably place this combination of subjects on an equality with the other subjects, for it is added to the requirements as they now stand; it is not a substitute for any other history subject. More time is to be given to the American history; whence it comes does not immediately concern us at this time. Already some of the best high schools have anticipated the new requirement, and are now teaching the American history along with the civil government; next year still others will adjust themselves to the new conditions. The stimulus given to popular interest in the history of the United States by the recent war with Spain, will undoubtedly make it easier than it otherwise would have been, to accord to American history the recognition and footing which it deserves, and which it has been too long denied as a secondary school subject.

The condition of history in the secondary schools of California has unquestionably improved in the three years

during which I have been observing it. There seems to be a better sentiment in the community as to the value of the subject in secondary instruction; more time is given to it; the methods in teaching it are better; it is more and more rare to find a teacher without any previous training in the subject, set to teaching history, with the sole qualification that he or she can read English with more or less understanding. History will never be well taught until the teacher has that grasp of the subject, that enthusiasm for it, which ordinarily comes only from careful training under a master in history. I am not urging that the teacher of history should be a specialist, devoting his whole time to that one subject, though I know of no serious objection to such a condition. But history should be something more to him than an occasional interest, something better than information for revenue only. For the teacher of history in a secondary school, it is by no means an unmitigated evil to have to teach some other subject for which he may be well prepared; if he be teaching Latin in connection with his Roman history, both subjects will probably profit by the combination.

One way of measuring the growing interest in history is found in the increasingly frequent inquiries which we are called upon to answer, regarding books for a school library. The boards and the principals are ready to give money to strengthen this department of the school's work. One school recently asked for a prescription for spending an appropriation of $75.00 for American history, while another has this year spent $400.00 for books covering the general field of history. All these are hopeful signs that the renaissance of interest in the history of our own time and our own country, which has come as one of the results of the events of the past year and a half, will bring in the desired reformation in teaching history. Perhaps with deeper and more vital interest, coupled with more careful study, there will come a saner, more intelligent, less noisy patriotism, a patriotism of expectation and determination

as well as of vociferous assertion and desire. Perhaps the time will come when I shall not feel in duty bound, in lecturing to my University classes, to espouse the British side of the Revolution quite so earnestly as I do now in order to overcome ingrained prejudices.

Another evidence that history is faring better in the schools, is clearly seen in the increased numbers electing the freshman courses in history in the University. Not so many students come in with a dislike for the dry-as-dust subject, a dislike which may be outgrown only in the senior year when it is probably too late to do justice to the newly discovered interest. Instead of this, more and more come with a distinct predilection for the study of history and the allied branches of economics and politics. A few figures will make the matter clearer. In the University of California, we give each half-year a course entitled, Introduction to History and Economics, designed especially for freshmen. The numbers electing this course during the first half-year have increased in a far greater ratio than the numbers for the whole undergraduate body; nor does this increase seem to be at the expense of the course in the second half-year. Two years ago there were in the first half-year, in round numbers, 120; last year, 150; this year, 180. The increase has not stopped with this course, for figures show a similar increase in the advanced work, for which the impetus could hardly have come solely from the work of the freshman year. But this course, taking the students fresh from the secondary schools, furnishes a peculiarly good test. In this connection it is worth noting that there is a gratifying tendency among the teachers of history to seek in a year or two of graduate study, better preparation for the growing demands upon them. In some instances, sacrifice of place and prospects has been made in order to do this. At least eleven such cases have come to my notice during the last two years.

There are some other phases of this subject which are not so gratifying as those signs of progress of which I have

been speaking. The work of coördinating the different parts of the study leaves very much to be desired. History does not repeat itself, but there are certain great permanent forces which work out from time to time in a strikingly similar, though cumulative, fashion, and it is the sure and unmistakable sign of a good teacher, that, by comparing these manifestations, the pupil is made to realize the unity of history and the reality of the life of men of other, even very remote, days and conditions. Take the matter of expansion of peoples and nations as a familiar example. Unless the student, as he goes on in his study, sees clearly some likeness of motives, processes, and results in the expansion of Greece, Rome, Spain, and England, not to mention the United States, there is something the matter with the teaching and probably with the teacher. The new entrance requirement will furnish a variant illustration. I do not believe that the best results in American history will be obtained by devoting one half-year to the history and the other half to the civil government, nor yet by adopting a scheme by which one subject will get two periods a week, and the other three periods. They must go together; as the story of the colonization of New England is taken up, the study of the township should go with it with such divisions of time as suit the teacher. So when the "critical period" is studied in the order of development, the close, intensive examination of the Constitution should follow. Here too might be the best place for the introduction and discussion of some of the more abstract notions of politics, such as the nation, the state, sovereignty, and law.

In the matter of expression, while there is evidence of some progress, there is abundant reason for sharp criticism and complaint. The ability to state information and conclusions in clear, connected, straightforward speech, is not receiving enough attention from teachers of other subjects than English. So deeply has this fact been impressed on the University examiners, that they have added to the entrance requirements, English A, Oral and Written

Expression, which affects all subjects as well as the English proper. The opportunity of the teacher of history for cultivating oral expression is second to none, and the results obtained in certain schools,—for example, the Girls' High School in San Francisco, where the accuracy and readiness of speech are noteworthy,—show that the ideal set is not at all an unattainable one for the majority of the high schools of this State.

Summarizing in a few words, I believe that the teaching of history in the secondary schools of California is steadily improving, and that the sentiment in support of the subject is growing everywhere. Whatever else may lose in the struggle for a place in the already crowded schedule, it is not likely to be history. California in these matters is already ahead of most other states, and this fact, with those just mentioned, should give us courage and hope in striving for still greater improvement.

THE VOICE IN SPIRITUAL EDUCATION.*

By FLETCHER B. DRESSLAR.

"To keep music in the schools is a necessity, and youth ought to be kept practicing this art, for it makes skillful, genteel people of them. A schoolmaster must be able to sing, or I would not recognize him." These are the words of Martin Luther, who wrote them at a time when the best music was cultivated almost exclusively for church services. His keenness in observation and his interest in education, however, led him to recognize the true value of music, despite the fact that it had been held within comparatively narrow channels by the church.

These introductory words will serve to suggest my theme. It is my desire to make a plea for better music work in the grades, and only incidentally to touch upon oral reading. You have of course noted that the title announced is an adaptation of one used by Professor Hiram Corson in one of his volumes, "The Voice and Spiritual Education." While I shall emphasize the subject from a different point of view, I wish to recommend his volume to all who appreciate the power of the voice, and are seeking help in teaching reading and literature.

The child is born physically deaf, and its ears are not unstopped until from three to ten days after birth. Gradually the ear becomes more delicate and capable of transmitting a greater and greater range and variety of

*Read at a meeting of the Musical Section of the California Teachers' Association, held at Sacramento, December, 1899.

excitation. When anatomically perfect the ear offers opportunity for cultivation far beyond that which is attained by our best musicians. Mr. Gilman, the Curator of the Boston Museum of Fine Arts, told me that he found it necessary, during the progress of his valuable study of Chinese music, to train himself to recognize and appreciate differences in pitch equal to one-eighth of a tone, "and," he added, "I did not find it a long and difficult task." Most of us are well satisfied if we acquire the power to distinguish readily and accurately differences of a half tone. But this satisfaction and this half development are due to lack of attention and mental training, not to a lack of organic ability. It is surprising indeed to see how many intelligent people there are, who believe themselves unable to learn to sing or even to appreciate music; and, as a result of this loss of faith in themselves, give no attention to cultivation of power along this line at all. Most of this apparent inability is due simply and solely to self-delusion.

It is a fact, made clear by scientific investigations and by common observation, that there are far fewer children functionally disqualified from learning to sing than there are of those who are color blind. Of course some children acquire the ability to sing much more readily than others, and show far greater talent in this direction. But such differences are exhibited in all other subjects, and ought to be expected in music. All are not equally quick in arithmetic. Some children readily acquire the power to express themselves in clear, forcible English, while others are tediously vague and halting of speech. Other things equal, children in the primary grades show a more decided taste for music than for any of the other subjects of the curriculum. For it must be remembered that the desire to express the emotional life through song and chant, is one of the most fundamental and deeply-rooted instincts of the race. Some instincts show a certain transitoriness, or a certain tendency to disappear with the progress of civilization; but this is not true of the instinct for musical expression. On

the contrary, while it shows itself very early in the life of the child, it persists in most cases throughout life, even to old age, and, with any sort of adequate opportunity, develops into a higher and more spiritual yearning.

In this fact music finds its chief claim as an educational agency. It is capable of moulding and developing the sensibilities of the race, for it lends itself to the whole range of emotional expression. It would be very foolish to claim that music could do this unaided. Indeed, it seems to me that we should look with more disfavor upon narrow specialization in music than we should upon narrowness in almost any other line of worthy endeavor. People who know nothing but music are usually disagreeable people, and, did it not seem a contradiction in terms, it would be safe to say that they are rarely truly musical. By this I mean to say that those who have not in some way brought themselves into harmony with the ideals of a liberal and many-sided culture, have no enlarged, noble, and serviceable sentiments to express.

Music, as an educational factor, exhibits its chief usefulness in moulding, directing, and shaping the spiritual life, which has grown up as a resultant of all the agencies brought to bear upon the intellect, the sensibilities, and the voluntary life of the individual. It harmonizes the life, it unifies the spirit, and, to use the phrase of President Stanley Hall, "it cadences the soul." The whole life needs an emotional focus as well as an intellectual focus. It needs to be gathered together and given power to express its emotional ideals, just as it needs intellectual unity and strength to put forth a valuable theory, devise a useful invention, or direct in the practical affairs of life.

It is neither my intention to argue nor my wish to suggest that music is the only means of developing, unifying, and expressing the emotional life; but there is a desire to say that there is no other instrumentality so universal in its application, and none other so free from technical difficulties and hindrances as vocal music.

The proper use of pictures in school work is an important obligation and ought not to be neglected by any teacher, especially in these latter days when we can get an artistic reproduction of a masterpiece for a penny. But we receive a picture, and in most instances never create one. Every song, however, demands action, and in a very vital way is a product of the singer. Besides, art for the eye can only represent a single phase or at most a few phases of the ideal which the artist had in mind; whilst music can begin a theme or emotional ideal and carry it through the whole gamut of its transitions and present it in its completion.

Music does not pretend to be a practical subject. It is a spiritual subject. This is the chief reason why we should all be anxious to do what we can to make it possible for teachers to give more time to music in our schools. The greatness of a civilization cannot be measured alone by its commerce, its inventions, or its literature; but by all these and more. The desire and to some degree the ability to express the purely emotional through music is well-nigh universal and, what is more important, it has ever been so. It is my desire not to over-estimate the value of music in the spiritual development of the child, but it is not unsafe to say that it is the subject *par excellence* which appeals to the spiritual natures of children. Other subjects of the curriculum make too great demands on the intellect, and as a result, if we depend on them for emotional food, the most important time for growth, the nascent period, is thus lost. Early training in singing is necessary if we hope to succeed in properly moulding the human spirit. Music, therefore, especially commends itself to us as an indispensable instrument in the careful education of young children. Still, by emphasizing its value in the early school years, there is no intention of suggesting by way of contrast its lack of importance later.

In the delightfully natural and simple story of his life Charles Darwin says that up to thirty years of age, he took

great delight in poetry and music, but that from his habit of dealing only with intellectual things in later life, Shakespeare nauseated him and he lost his taste for music. He says his mind became a sort of machine for grinding out general laws from observed facts. He adds, "If I had my life to live over again I would have made a rule to read some poetry and listen to some music at least once a week; for perhaps the part of my brain now atrophied would thus have been kept active through use. The loss of these tastes is a loss of happiness, and may possibly be injurious to the intellect, and more probably to the moral character by enfeebling the emotional part of our nature." Goethe says: "A man should hear a little poetry and see a fine picture every day of his life, in order that worldly cares may not obliterate the sense of the beautiful which God has implanted in the human soul."

Now if these foregoing statements are true, and we certainly believe they are, what ought we to do? How can we deal with music in the schools to the best advantage of the children? At the risk of being very dogmatic, and of appearing to cover ground which would seem to demand the wisdom of a specialist in both music and education, I am going to voice for the first time what it seems to me we must do to make our music in the public schools what it should be—a more potent agency for spiritual growth:

(1) Save time on our daily programmes for music, and slight it no more than we do other subjects. It is not necessary nor is it advisable to give it as much time as we give to the English work, but such time as we know it ought to have, use this time for nothing else.

(2) Cease wasting the time of the little folks by introducing them to music through the use of notes. Learning to read music is important, but learning to hear it and to sing it is of far greater importance and should come first. It is as unpedagogical to set children to work to learn the technical details of music before they have learned to sing as it would be to undertake to teach them to compose before

they can speak, or to dance before they can walk. It is certainly irrational to expect the children of the primary grades to do much singing, when three-fourths of the time set apart for music, is taken up with drill on sharps and flats, keys and staves. Publishing firms are adding fuel to the flame, by urging upon teachers all kinds of so-called systems of music, all devised to keep the little folks busy day after day on the merest technicalities. Thus it happens that the best time to create a taste for good music is not only allowed to pass by unused, but a dislike for the music work is often developed and worse still a misunderstanding of it is engendered.

(3) Teachers must cease to be indifferent to the value of music, and must come to feel their proper responsibility regarding their preparation to teach it. It may be well to have special teachers for music in city schools, but this will depend entirely upon the teacher, and her fitness. My experience has led me to believe that very few of our special teachers of music know anything about what is best for children to do. Usually such teachers are selected wholly upon the basis of personal attainment in music, and hence, if they learn to teach properly at all, they do it at the expense of the children. Special teachers of music, who have not studied the subject carefully from the educational side, invariably begin at the wrong place. They burden the children with technicalities and so-called methods, instead of teaching them to sing. If we are to use the public schools as an opportunity for developing a worthy taste for good songs, the regular teachers must do the main part of the work. They cannot shift the responsibility upon the special teachers who may see the children not oftener than once a month. So it is perfectly justifiable to require some musical ability of all teachers.

(4) Progress in music must be measured mainly by the ability to express and interpret it, not merely by the ability to read it. English teachers surpass us in their music in the schools, because they emphasize the singing almost

exclusively. When John Curwen introduced the Tonic-Sol-Fa into the schools of England, he did it not because he wished to do away with the staff notation, but to prevent the teachers from wasting the children's time, and to make it possible for the people to sing. The teachers of Germany are skillful in the teaching of music because they teach it in a psychological way rather than in a logical way. They teach their children to sing many songs by rote, and to sing them well. Then they approach the notes through these songs. In this way they give their pupils excellent drill in singing, and when the proper time comes easily lead them to read music through songs which they already know. Twenty years ago the National Teachers' Association of Germany passed a series of resolutions embodying their principles relating to the teaching of music in the public schools. With your permission I should like to read some of these because they represent fairly well what has been going on there ever since in the way of music teaching in the schools:

(a) Artistic results can not be expected and must not be demanded, but an inspiration for musical perfection should be awakened in the pupils.

(b) No songs should be taught and practiced which are not of undoubted poetic and musical value.

(c) In the teaching of even the simplest song the object must be to express that which poet and composer intended; the technique is not to be an aim but a means.

(d) The education of the German nation by means of music and through music has a national significance.

(e) Instruction in singing should be given with the aid of a musical instrument, be that violin, piano, or organ; and the instruction can be successful only when the teacher is well trained in the use of his instrument.

(f) Pedagogical treatment in music lessons presupposes a teacher who is professionally prepared, and skillful in the art of music.

(g) Music is not only to create pleasure in melody and harmony, but it is designed to have an ennobling effect upon the heart.

(5) In striving to help children acquire skill in vocal expression, less can be accomplished at first by directing attention to the physiological processes connected with tone production, than by throwing the initial emphasis upon the proper perception of tone. When children are able to image tones accurately there will be present an inner directing force which will unconsciously help them to properly adjust their vocal organs. This applies to pitch, to quantity, and to quality of tone. And here comes a practical problem for our teachers. Suppose the teacher is unable to distinguish with sufficient accuracy in these things, how is she to get the proper tones for the children to hear? If she cannot sing and has no instrument with which to guide the class, there is nothing left for her to do but to have some of her pupils do the work for her, or else—be married. In almost every school-room of Germany, even in the rural districts, a violin, an organ, or a piano is as much a part of the school furnishings as a black-board, and the teachers are capable performers.

It has been my pleasure recently to teach music for a time in the primary grades, and, notwithstanding it was in a large measure a repetition of former experience, I was astonished, as no doubt you all have been, at the readiness with which the little folks learned a song by rote. Two repetitions, or at most three, were sufficient to teach them both melody and words. No such readiness as this is found in any other subject of the curriculum.

(6) Each teacher ought to have at her command a score or two of beautiful ennobling songs which have grown up out of the hearts of the people. These ought to be selected to suit the advancement and special needs of her class; and she ought to make it her business to teach them to sing these songs with the spirit and the understanding. Wagner expressed a deep truth when he said, "The Folk is the

epitome of all those men who feel a common and collective want. To it belong then all of those who recognize their individual want as a collective want, or find it based thereon." "The popular airs of Germany," says a recent writer, "both text and melody, are the most fragrant blossoms of that country. The heart of the German people pulsates in these songs, and he who studies them will find revealed in them the German nation in all its strength and weakness, in all its virtues and faults."

One of the serious drawbacks to the progress of music in the public schools of this State has been due to the fact that teachers have not been furnished with lists of good songs suitable to their grades. An earnest attempt is now being made however to remedy this difficulty. Two of our best teachers are engaged in compiling a list of such songs and are to report on their work at this session of the Association. We believe such a collection will be of very great service to the educational interests of the State.

In the early part of this paper it was said that music is not a practical subject, using the word practical in its usual narrow sense; yet we all know that proper training in vocal music aids the pupils greatly in other subjects. The most persistent problem in the teaching of reading and vocal expression in general is the cultivation of the hearing. Unless the child has learned to hear great varieties of tonal expression, it is impossible to teach him to read with sufficient flexibility of voice to make clear the meaning of his sentences. All teachers know how difficult it is to get expressive reading, despite the fact that the thought of the selection may be clear and easily understood. It requires the most persistent and skillful teaching to prevent reading from degenerating into mere word calling. Proper training in singing is of much help here. It renders the voice flexible and creates an internal demand for true vocal interpretation. The cultivation of power to read well, refines not only the emotions to be expressed, but also results in the ability to perceive more clearly the thought

contained in the selection. It is possible to express by means of a well-trained voice, shades of thought and feeling which words alone cannot carry. There gathers about many words a halo of meaning which the voice alone can reveal. The voice can make clear what explanation and mere words cannot impart. To insist on correct vocal expression is often worth more than to demand analytical exposition. The voice is far more powerful with children than dictionary definitions.

There is properly much made of nature study in our schools to-day, but it is almost entirely for the eye. Who ever heard of a teacher taking her pupils out to listen? If an excursion is made at all it is always to see. Still we are much given to talking about the songs of the birds just as if we knew them quite well. In reality comparatively few of us could identify a score of birds by their notes. This is true notwithstanding the fact that this phase of bird life is of very great interest from a purely scientific point of view. Pardon a single instance by way of illustration: So far as I have been able to judge, the meadow-lark found on this coast is very similar in form, coloring, and habits to the one found in the Middle States; but his note is so markedly different in quality that one listens with much wonder. His environment, his companions, his associations in some way have combined not only to sweeten and enrich his tone, but also to change the form of the melody until the effect is strangely different. The problems of life and evolution are not limited to things visible and tangible, but appeal to the ear as well. He who has been taught to listen and has learned to estimate and interpret what he hears, can go as far into the mysteries of life as he with scalpel and microscope. True, it is another phase of life, but who will dare say that it is less important?

THE COMMERCIAL MUSEUM.

The first official step in the direction of establishing a Commercial Museum in San Francisco was the passage of the following resolution by the Board of Trustees of the Mechanics' Institute, January 9, 1900:

"WHEREAS, it is greatly in the interest of this City that a Commercial Museum of the kind and pattern of that now in the City of Philadelphia be established here, be it resolved, that Doctor Benjamin Ide Wheeler, President of the University of California, be requested to call at his earliest convenience a meeting of the Boards of Officers of the Chamber of Commerce, Merchants' Association, State Board of Trade, Mechanics' Institute, and such other bodies and individuals as he may deem proper to confer with a Committee of the School of Commerce of the Faculty of the State University in order to take initial steps toward the establishment of a Commercial Museum in this City."

In response to this resolution President Wheeler issued a call to the different trade associations in San Francisco to send delegates to a conference, held at the Mark Hopkins Institute of Art, January 23, 1900. The following named gentlemen were invited to attend:

Merchants' Association: Isaac Upham, S. Sussman, Horace B. Sperry, Everett N. Bee, Adolph Mack, F. W. Dohrmann (President), and J. Richard Freud (Secretary).

California State Board of Trade: J. S. Emory, W. H. Mills, N. W. Spaulding, N. C. Chipman, B. N. Rowley, J. A. Filcher (Secretary).

Manufacturers' and Producers' Association of California: Wakefield Baker, Charles B. Platt, James W. Kerr, Lippmann Sachs, Eugene Goodwin, Andrera Sbaboro (President).

University of California: Benjamin Ide Wheeler, Arthur Rodgers, Ernst A. Denicke, Carl C. Plehn, George Davidson, Bernard Moses, Armin O. Leuschner.

Chamber of Commerce: Irving M. Scott, W. R. Wheeler, Gustave Niebaum, Rufus P. Jennings, George A. Newhall, Charles Nelson (President), Ebenezer Scott, (Secretary).

Mechanics' Institute: Willis G. Dodd, Byron Jackson, S. J. Hendy, George E. Dow, George Cumming, Mr. Frazer, Joseph M. Cumming (Secretary).

Oakland Board of Trade: M. J. Keller, Cragie Sharp, E. W. Marston (President).

James D. Phelan, Horace Davis, M. H. deYoung, W. S. Leake, A. M. Lawrence, John D. Spreckels, Claus Spreckels, R. P. Schwerin, A. A. Watkins, Louis Sloss, Lewis Gerstle, Hugh Craig.

President Wheeler called the meeting to order and spoke in part as follows:

"I speak at a time when the interests of California, the Coast, and its chief city have reached a crisis in point of their development. The action of the Mechanics' Institute in calling me as the head of the University of California to open this meeting is an indication that something is moving in the life of California as it never moved before. It is no small matter with which we are dealing. It is a matter which concerns the largest life of this community and the largest life of the nation. It has long been thought that sooner or later San Francisco must claim its portion in dealing with the great Orient beyond. Many have been disappointed that San Francisco has not grown as rapidly as expected. But there has been a shifting in the world's interests in the last two years, and the man who fails to see is blind to history and its opportunities.

No matter what may be his political views, the man

who looks widely can have no doubt of the trend of commerce. It certainly has become perfectly clear that upon San Francisco has been thrown great responsibility and great opportunity. With its magnificent natural harbor on the western shore of the nation, with its power and aggressiveness, California is forcing westward, where lie the great commercial opportunities in the newly-discovered Orient.

The world has passed the stadium where matters of trade and commerce are left to chance. Men are coming to learn that commerce means an understanding and grasp of conditions. Germany has taught us how to proceed. She has gone ahead after the old methods of the pedantic gymnasia; the universities have aided to advance by intelligent methods. The world of the coming century is to be based on a scientific study of what the world needs. We have heard much of the Philadelphia Museum of Commerce. It is ready to place at our disposal its magnificent resources, provided we place our organization above the suspicion of individual usefulness and look to the common good of all.

Shall the city of San Francisco cast off its traditions of the mere individual struggle for existence, and take upon itself the idea of coöperation, merging its strength toward the common good? It is my religion that the way for a man to succeed is to make a success of a community. The community succeeds with the nation and by the community falling in with the current of national endeavor. Shall we join hands in advancing a great community endeavor? Shall we band ourselves together for service in the interests of the Pacific Coast? Let us all remember that what serves the interests of the Pacific Coast serves the interests of the nation which we all love. This is a time when we have reached a crisis in the development of California, of San Francisco, and I feel that this move is an indication that something is stirringw hich means a new life to all of us. There is an awakening such as this community has never before realized."

Two plans for the organization and maintenance of the Museum were presented, one by Mr. M. H. deYoung and one by Mr. C. C. Plehn. After some discussion of the desirability of such a Museum for San Francisco, the gentlemen present at the conference organized themselves into a Promotion Committee, elected President Wheeler Chairman and Professor Carl C. Plehn Secretary, and authorized the appointment by the Chairman of a Committee of ten together with the Chairman and Secretary on Organization and Maintenance. The sub-committee thus authorized was appointed a week later by President Wheeler in consultation with the presidents of the different trade organizations. That committee consists of Messrs. N. C. Chipman, M. H. deYoung, Arthur Rodgers, James D. Phelan, Lippman Sachs, Andrea Sbarboro, Ebenezer Scott, Claus Spreckels, F. J. Symmes, Isaac Upham, A. A. Watkins, Wm. R. Wheeler, together with the Chairman and Secretary of the Promotion Committee. They are to report at a meeting of the Promotion Committee to be called by the Chairman.

CURRENT NOTES.

During the second term of 1899-1900, the following University Extension courses, free to the public, will be given:

I. Philosophy.—Ten lectures by Dr. W. P. Montague, at the Mark Hopkins Institute of Art. The titles of these lectures are as follows: The nature and scope of metaphysics; The objections to metaphysics; The history of metaphysics; The educational value of the study of metaphysics; The theory of materialism; The doctrine of idealism; The problem of the soul; The problem of God; The religious spirit and the spirit of science; and The metaphysical ideal of life.

II. Geology and Physical Geography.—Ten lectures by Dr. H. W. Fairbanks, in the auditorium of the Young Men's Christian Association Building, San Francisco, on Some Important Events in the Geological History of the Pacific Coast. The titles of the lectures are as follows: Introductory—The relation of the present to the past in the study of the earth; Outline of the geological history of the Pacific

Coast; Development of the physical features of the earth and their dependence upon the geological structure; The scenic features of the Coast Ranges and their relation to recent geological events; The origin of the Sierra Nevada mountains, the Cascades, and the Great Basin ranges; The earthquakes of California and their effects upon the topography; The extinct volcanoes of California; The glacial period in the Sierra Nevada mountains; Glacial Lake Lahonton, and modern Pyramid Lake, Nevada; and The story of Crater Lake, Oregon. The lectures will be illustrated by lantern slides made from photographs from nature by Dr. Fairbanks.

III. Pedagogy.—Four lectures by Professor Elmer E. Brown, at the State Normal School Building, San Francisco, on The History of American Schools. The titles of these lectures are as follows: Colonial schools; Earlier schools in the United States; Later schools; and American educational ideals.

IV. Lectures on China.—Three lectures by Professor John Fryer, in the rooms of the Adelphian Club, Alameda. The titles of these lectures are as follows: Confucianism; Taoism; Buddhism.

V. College of Commerce Lectures.—Three lectures by Associate Professor Plehn, at the Mark Hopkins Institute of Art. Subject, The Commerce of the Pacific. Five lectures by Assistant Professor Page, at the Mark Hopkins Institute of Art. Subject, The Commercial Development of the United States.

VI. Spanish.—A course in introductory Spanish will be given by Mr. C. H. Howard, at the Mark Hopkins Institute of Art.

VII. Chinese.—A class in the Cantonese language will be conducted by Rev. John E. Gardner, at the Mark Hopkins Institute of Art.

VIII. Archaeology.—A course of lectures on Archaeology by Professor Alfred Emerson, formerly Professor of Archaeology in the American School at Athens, will be announced later.

The eighth annual session of the Southern California Teachers' Association was held at Los Angeles on December 21, 22, and 23. Among the addresses were the following by members of the University of California: The American Boy, and The Relation of the Secondary School to the University, by President Wheeler; The Ethics of Teaching, by Professor Brown; Higher Commercial Education, by Professor Plehn; The Master Teacher, by Professor Bailey; and New Problems in the Study of Society, by Professor Moses.

On the afternoon of December 29 in the lecture-room of the Mark Hopkins Institute of Art the Philological Association of California was organized. Among the papers read were the following by members of the University of California: The Place of Philology, by President Wheeler; The Pronominal Group of Words, its real Differentia, and its Classification in Modern English, by Professor Bradley; On the Reading of Broken Ionics, by Professor Clapp; On Certain Supposed Irregularities in the Versification of Robert Greene, by Professor Gayley; Dramatic Satura in relation to Book Satura and the Fabula Togata, by Dr. Hopkins; Pleonastic Formative Elements in the Semitic Languages, by Professor Margolis; Cicero's Use of the Imperfect and Pluperfect Subjunctive in *si*-clauses, by Dr. Nutting; Commands and Prohibitions in Horace, by Dr. Price; and A Restatement of Certain Elementary Principles in Latin Prosody, by Professor Richardson.

The thirty-third annual session of the California Teachers' Association was held at Sacramento from December 26 to 30, inclusive. Among the addresses were the following by members of the University of California: Ancient History: its Place and Purpose, and The University and the Schools, by President Wheeler; Personal and Political Interference with the Administration of Educational Institutions and Affairs, by Regent George C. Pardee; The Work of a few typical States toward Greater Uniformity and Usefulness, and Local History in the Schools, Materials and Methods, by Professor Brown; Plant Life in Nature Study, by Dr. Osterhout; The "Source Method" of Teaching History in Schools, by Professor Page; and The Condition of History Teaching in the High Schools of California, by Professor Babcock.

On the evening of December 28 a reception in honor of President Wheeler was held by the Association in the Crocker Art Gallery.